

Research Proposal: Parental Awareness and Associated Risk Factors for Recurrent Respiratory Infections Among Preschool Children in Riyadh, Saudi Arabia

1. Introduction

Recurrent respiratory infections (RRIs) represent a pervasive and significant global health challenge, particularly affecting the pediatric population. These infections, characterized by repeated episodes of respiratory illness, impose a substantial burden on children, their families, and healthcare systems worldwide [1]. The vulnerability of preschool children (typically defined as those aged between 1 month and 5 years) to RRIs is well-documented, primarily due to their developing immune systems, increased exposure to pathogens in group settings like daycare, and often, a lack of fully established hygiene practices [2]. The consequences of RRIs extend beyond acute illness, potentially leading to chronic respiratory conditions, developmental delays, and significant disruptions to family life and parental productivity [3].

In the Kingdom of Saudi Arabia (KSA), respiratory infections are a leading cause of morbidity and healthcare utilization among children. The unique demographic, environmental, and socio-cultural landscape of Riyadh, the capital city, presents a specific context that warrants focused investigation. Riyadh is a rapidly growing metropolis with a diverse population, varying socioeconomic strata, and distinct environmental factors, including dust storms and air quality concerns, which can influence respiratory health [4]. Despite the recognized prevalence of respiratory illnesses, comprehensive research specifically addressing the interplay between parental awareness, modifiable risk factors, and the incidence of RRIs among preschool children in this specific urban setting remains limited.

Previous studies in Saudi Arabia have shed light on the viral etiology of respiratory infections, identifying common culprits such as Respiratory Syncytial Virus (RSV), human Rhinovirus (hRV), and influenza viruses as major contributors to acute respiratory tract infections (ARTIs) in pediatric populations [5, 6]. The burden of bronchiolitis, often caused by RSV, has been particularly noted, with significant hospitalization rates among young children [7]. However, these studies often focus on clinical aspects or specific

pathogens, leaving a gap in the understanding of how parental knowledge, attitudes, and practices contribute to the prevention and management of these recurrent episodes.

Parental awareness plays a pivotal role in child health outcomes. Informed parents are more likely to adopt preventive measures, recognize early signs of illness, seek timely medical attention, and adhere to treatment protocols, thereby potentially reducing the frequency and severity of RRIs [8]. Conversely, a lack of awareness or misconceptions, particularly regarding antibiotic use for viral infections, can contribute to antibiotic resistance, a growing global health crisis [9]. Understanding the current levels of parental awareness and identifying specific knowledge gaps in Riyadh is therefore critical for designing effective public health interventions.

Furthermore, a myriad of risk factors contribute to the susceptibility of preschool children to RRIs. These include, but are not limited to, environmental exposures (e.g., passive smoking, indoor air pollution), socioeconomic determinants (e.g., household income, parental education), and child-specific biological factors (e.g., nutritional status, daycare attendance, presence of siblings, underlying allergic conditions) [10, 11]. While some of these factors are universally recognized, their specific impact and prevalence can vary significantly across different geographical and cultural contexts. A localized investigation in Riyadh is essential to identify the most pertinent risk factors in this setting, allowing for the development of targeted and culturally sensitive interventions.

This research proposal outlines a comprehensive study designed to investigate parental awareness and associated risk factors for recurrent respiratory infections among preschool children in Riyadh, Saudi Arabia. By systematically exploring these critical areas, the study aims to generate evidence-based insights that can inform public health policies, enhance parental education programs, and ultimately contribute to improving the respiratory health and overall well-being of young children in the region. The findings are expected to provide a foundation for future longitudinal studies and intervention trials, fostering a healthier environment for the youngest members of the Riyadh community.

2. Research Problem

Recurrent respiratory infections (RRIs) in preschool children pose a significant and multifaceted public health challenge in Riyadh, Saudi Arabia. While the global burden of RRIs is well-established, and some regional data exist regarding the prevalence of respiratory pathogens, a critical gap remains in the comprehensive understanding of the specific local context. This knowledge deficit is particularly pronounced in two key areas: the precise identification and quantification of associated risk factors within the Riyadh

population, and the assessment of parental awareness regarding these infections and their prevention.

Currently, healthcare providers and public health officials in Riyadh operate with a generalized understanding of RRI epidemiology, often relying on international data or broader national statistics that may not fully capture the unique dynamics of this specific urban environment. Riyadh, characterized by its rapid urbanization, diverse expatriate and local populations, and distinct environmental conditions (such as frequent dust storms and varying air quality levels), likely presents a unique set of contributing factors to pediatric respiratory health [12]. Without a granular understanding of these localized risk factors, interventions designed to mitigate the incidence and severity of RRIs may prove to be less effective or misdirected.

Furthermore, the role of parental awareness and practices is often underestimated in the chain of infection and prevention. Parents are the primary caregivers and decision-makers for preschool children, and their knowledge, attitudes, and behaviors directly influence a child's exposure to risk factors, adherence to preventive measures, and timely access to appropriate medical care [8]. Existing literature, even from within Saudi Arabia, often focuses on clinical outcomes or microbiological aspects, with limited in-depth exploration of the parental perspective. For instance, studies on parental awareness often concentrate on specific issues like antibiotic use, without a broader assessment of their understanding of RRI causes, transmission, prevention strategies, and appropriate home management [9]. This lack of specific data on parental awareness in Riyadh means that public health campaigns and educational initiatives may not be adequately tailored to address existing knowledge gaps or cultural nuances, potentially limiting their impact.

The absence of comprehensive, localized data on both risk factors and parental awareness creates a significant impediment to developing targeted, evidence-based public health strategies. Without knowing precisely which risk factors are most prevalent and impactful in Riyadh's preschool population, and without understanding where parents' knowledge and practices fall short, efforts to reduce the burden of RRIs will remain suboptimal. This research aims to directly address this critical knowledge gap by providing a detailed, context-specific analysis that can serve as a foundation for more effective and culturally appropriate interventions, ultimately contributing to improved respiratory health outcomes for preschool children in Riyadh.

3. Importance and Objectives of the Research

3.1. Importance of the Research

This research holds significant importance for several reasons, impacting public health, clinical practice, and family well-being in Riyadh, Saudi Arabia:

- 1. Addressing a Significant Public Health Burden:** Recurrent respiratory infections are a leading cause of morbidity and healthcare utilization among preschool children globally and particularly in Saudi Arabia. By providing a comprehensive understanding of the local epidemiology and associated risk factors in Riyadh, this study will contribute to a more effective public health response, potentially reducing the incidence and severity of these infections. This translates to fewer hospitalizations, emergency room visits, and outpatient consultations, thereby alleviating the strain on the healthcare system.
- 2. Informing Targeted Interventions:** Current public health strategies may not be optimally effective due to a lack of localized, granular data. This research will identify the most prevalent and impactful risk factors specific to Riyadh's preschool population. Such precise identification will enable the development of highly targeted and cost-effective interventions, moving beyond generic recommendations to address the unique challenges faced by families in this urban environment. For example, if indoor air quality or specific daycare practices are identified as major contributors, interventions can be designed to address these directly.
- 3. Enhancing Parental Empowerment and Education:** Parents are at the forefront of child health management. By assessing current levels of parental awareness and identifying specific knowledge gaps regarding RRI, this study will provide crucial information for designing tailored educational programs. Empowering parents with accurate information about prevention, early recognition of symptoms, and appropriate home management can significantly improve child health outcomes, reduce unnecessary antibiotic use, and foster a more proactive approach to respiratory health within families. This is particularly vital in combating antimicrobial resistance, a global health threat exacerbated by inappropriate antibiotic use for viral infections.
- 4. Optimizing Resource Allocation:** Healthcare resources are finite. By pinpointing the most significant risk factors, policymakers and healthcare administrators can allocate resources more efficiently towards preventive measures and early intervention programs that yield the greatest impact. This could include investments in public awareness campaigns, improved environmental health

regulations, or enhanced primary care services focused on pediatric respiratory health.

5. **Contributing to the Scientific Literature:** This study will fill a critical gap in the existing scientific literature by providing comprehensive, localized data on parental awareness and risk factors for RRI in Riyadh. This will serve as a valuable resource for future research, informing longitudinal studies, intervention trials, and comparative analyses across different regions. The findings will also contribute to a broader understanding of pediatric respiratory epidemiology in the Middle East.
6. **Improving Quality of Life for Children and Families:** Frequent respiratory infections can significantly impact a child's quality of life, leading to discomfort, sleep disturbances, missed schooling, and potential long-term health consequences. For families, RRI can result in parental stress, lost workdays, and financial burdens. By contributing to the reduction of RRI incidence and severity, this research ultimately aims to improve the overall well-being and quality of life for preschool children and their families in Riyadh.

3.2. Objectives of the Research

Building upon the identified research problem and its importance, this study aims to achieve the following specific objectives:

1. **To determine the prevalence and characteristics of recurrent respiratory infections among preschool children (aged 1 month to 5 years) in Riyadh, Saudi Arabia.** This objective seeks to establish baseline epidemiological data, including the frequency, duration, and types of RRI experienced by the target population over a defined period.
2. **To identify and quantify the associated risk factors for recurrent respiratory infections in preschool children in Riyadh.** This objective will involve a comprehensive assessment of various potential risk factors, categorized as:
 - **Environmental Factors:** Including exposure to passive smoking, indoor air quality (e.g., ventilation, presence of mold/dampness), and outdoor environmental conditions (e.g., dust, pollution).
 - **Socioeconomic Factors:** Such as parental education level, household income, family size, and access to healthcare services.
 - **Child-Specific Factors:** Including age, gender, birth order, nutritional status (e.g., breastfeeding history, micronutrient supplementation), daycare attendance, presence of siblings, and history of allergies or other chronic conditions.

3. **To assess the level of parental awareness, knowledge, and practices regarding the causes, prevention, and management of recurrent respiratory infections in their preschool children.** This objective will explore parents' understanding of RRI etiology (viral vs. bacterial), effective preventive measures (e.g., hygiene, vaccination), appropriate responses to symptoms, and attitudes towards antibiotic use.
4. **To explore the relationship and associations between parental awareness, identified risk factors, and the incidence of recurrent respiratory infections in preschool children.** This objective aims to determine how parental knowledge and specific risk factors interact to influence the likelihood and frequency of RRIs, thereby identifying potential areas for intervention.
5. **To provide evidence-based recommendations for public health interventions and educational programs aimed at reducing the burden of recurrent respiratory infections among preschool children in Riyadh.** The ultimate goal is to translate research findings into actionable strategies that can be implemented by healthcare authorities, educators, and community organizations to improve child respiratory health.

4. Research Hypotheses

Based on the existing literature, the identified research problem, and the specific objectives of this study, the following hypotheses will be tested:

4.1. Hypothesis 1: Environmental Factors and RRI Incidence

H1a: There is a significant positive association between exposure to passive tobacco smoke within the household and the incidence of recurrent respiratory infections in preschool children in Riyadh.

- **Rationale:** Passive smoking is a well-established risk factor for respiratory illnesses in children, leading to impaired lung function, increased susceptibility to infections, and prolonged recovery times [13, 14]. In a household setting, children are particularly vulnerable to secondhand smoke from parents or other family members. This hypothesis aims to quantify this association specifically within the Riyadh context.

H1b: Poor indoor air quality, characterized by inadequate ventilation and/or the presence of mold/dampness, is significantly associated with a higher incidence of recurrent respiratory infections in preschool children in Riyadh.

- **Rationale:** Indoor air pollutants, including those from cooking, heating, and biological agents like mold, can irritate the respiratory tract and compromise immune responses, increasing susceptibility to infections [15]. Given the climate and housing characteristics in Riyadh, indoor air quality could be a significant, yet under-explored, environmental determinant of RRI. This hypothesis will investigate the direct link between these factors and RRI frequency.

4.2. Hypothesis 2: Socioeconomic Factors and RRI Prevalence

H2a: Lower parental education levels are significantly associated with a higher prevalence of recurrent respiratory infections among preschool children in Riyadh.

- **Rationale:** Parental education often correlates with health literacy, understanding of preventive measures, and access to and utilization of healthcare services [16]. Parents with higher education may be more aware of hygiene practices, vaccination importance, and appropriate responses to illness, thereby potentially reducing their children's risk of RRIs. This hypothesis explores this relationship in the Riyadh setting.

H2b: Lower household income is significantly associated with a higher prevalence of recurrent respiratory infections among preschool children in Riyadh.

- **Rationale:** Socioeconomic disadvantage can lead to crowded living conditions, poorer nutrition, limited access to quality healthcare, and increased exposure to environmental hazards, all of which are risk factors for RRIs [17]. This hypothesis aims to determine the extent to which economic disparities contribute to RRI burden in Riyadh.

4.3. Hypothesis 3: Parental Awareness and RRI Incidence

H3a: Lower parental awareness regarding effective preventive measures (e.g., hand hygiene, avoiding sick contacts, vaccination) is significantly associated with a higher incidence of recurrent respiratory infections in preschool children.

- **Rationale:** Parental knowledge and adherence to preventive practices are crucial in mitigating the spread of respiratory pathogens. A lack of understanding or inconsistent application of these measures can increase a child's exposure and susceptibility to infections [8]. This hypothesis directly links parental awareness of prevention to RRI outcomes.

H3b: Misconceptions or inappropriate attitudes regarding antibiotic use for respiratory infections among parents are significantly associated with a higher incidence or prolonged duration of recurrent respiratory infections in preschool children.

- **Rationale:** Over-reliance on antibiotics for viral infections not only contributes to antimicrobial resistance but can also delay appropriate management of symptoms and potentially lead to adverse effects. Parental demand for antibiotics can influence prescribing practices, impacting child health [9]. This hypothesis investigates the impact of parental attitudes towards antibiotics on RRI patterns.

4.4. Hypothesis 4: Child-Specific Factors and RRI Risk

H4a: Daycare attendance is significantly associated with an increased incidence of recurrent respiratory infections in preschool children in Riyadh.

- **Rationale:** Group childcare settings facilitate the rapid transmission of respiratory viruses due to close contact among children and shared environments [18]. This is a widely recognized risk factor, and this hypothesis aims to confirm its relevance and impact within the Riyadh context.

H4b: Suboptimal nutritional status (e.g., lack of exclusive breastfeeding, inadequate micronutrient intake) is significantly associated with a higher incidence of recurrent respiratory infections in preschool children.

- **Rationale:** Breastfeeding provides crucial antibodies and immune factors that protect infants from infections [19]. Deficiencies in essential micronutrients like Vitamin D can impair immune function, increasing susceptibility to respiratory illnesses [20]. This hypothesis explores the role of nutritional factors in RRI susceptibility.

H4c: The presence of underlying allergic conditions (e.g., asthma, allergic rhinitis) is significantly associated with a higher incidence and/or severity of recurrent respiratory infections in preschool children.

- **Rationale:** Allergic conditions can lead to chronic inflammation and hyper-responsiveness of the airways, making children more vulnerable to infections and experiencing more severe symptoms [21]. This hypothesis aims to confirm the impact of atopy on RRI burden in the study population.

These hypotheses will guide the data collection and analysis, providing a structured framework for investigating the complex interplay of factors contributing to recurrent respiratory infections among preschool children in Riyadh. The findings will either

support or refute these hypotheses, thereby contributing to the evidence base for targeted interventions.

5. Literature Review

Recurrent respiratory infections (RRIs) in early childhood represent a global health challenge, characterized by their high incidence, significant morbidity, and substantial socioeconomic impact. This section provides a comprehensive review of the existing literature on RRI in preschool children, focusing on their epidemiology, etiology, and a detailed examination of various predisposing and risk factors, with a particular emphasis on studies conducted in Saudi Arabia and the broader Middle East region where available.

5.1. Definition and Epidemiology of Recurrent Respiratory Infections

While there is no universally accepted definition for RRI, they are generally characterized by an abnormally high frequency of respiratory tract infections within a given period. Common definitions include 6-8 or more respiratory infections per year, or 3-4 or more lower respiratory tract infections per year [22]. These infections primarily affect the upper respiratory tract (e.g., common cold, pharyngitis, otitis media, sinusitis) but can also involve the lower respiratory tract (e.g., bronchitis, bronchiolitis, pneumonia). The distinction between upper and lower RTIs is crucial as their etiologies, clinical courses, and potential complications can differ.

The epidemiology of RRI is complex, influenced by a myriad of factors including age, environmental exposures, socioeconomic status, and host immunity. Preschool children are particularly susceptible, with estimates suggesting that up to 25% of children experience recurrent RTIs during their first four years of life [1, 2]. This high incidence is largely attributable to their immunological immaturity, which renders them more vulnerable to novel pathogens, and their increased exposure in social settings such as daycare centers [23]. The peak incidence of RTIs often occurs between 6 months and 2 years of age, coinciding with the waning of maternal antibodies and increased social interaction.

In Saudi Arabia, respiratory infections are a leading cause of pediatric morbidity and hospital admissions. Studies from various regions within the Kingdom consistently report a high prevalence of acute respiratory infections (ARIs) among children. For instance, research in southwestern Saudi Arabia highlighted the significant burden of viral etiologies in pediatric respiratory infections [5]. Another study focusing on Riyadh specifically examined the epidemiology and associated factors for hospitalization-related acute viral respiratory infections among children, underscoring the local

relevance of these conditions [24]. The unique climatic conditions, including dust storms, and the rapid urbanization of cities like Riyadh, may further influence the epidemiology of respiratory illnesses in the region [4].

5.2. Etiology of Recurrent Respiratory Infections

The vast majority of RRI in preschool children are viral in origin, with bacteria playing a secondary role, often as co-infections or complications. A comprehensive understanding of the viral landscape is crucial for appropriate management and public health interventions.

5.2.1. Viral Pathogens

- **Respiratory Syncytial Virus (RSV):** RSV is consistently identified as the most common cause of lower respiratory tract infections (LRTIs) in infants and young children worldwide, including Saudi Arabia [25]. It is a major cause of bronchiolitis and pneumonia, often leading to hospitalization, particularly in infants under 12 months of age. Studies in Saudi Arabia have confirmed RSV as a predominant pathogen, with seasonal peaks often observed during winter months [6, 7]. The post-COVID-19 pandemic period has seen shifts in RSV epidemiology, with some regions experiencing earlier and more intense outbreaks [7].
- **Human Rhinovirus (hRV):** hRV is the most frequent cause of the common cold and is also implicated in bronchiolitis, asthma exacerbations, and other LRTIs in children [26]. Its high prevalence and genetic diversity contribute to its significant role in recurrent infections. Studies in Saudi Arabia have also identified hRV as a common respiratory pathogen in pediatric populations [5].
- **Influenza Viruses (A and B):** Influenza viruses are responsible for seasonal epidemics and can cause severe respiratory illness, particularly in young children, leading to complications such as pneumonia and otitis media. Vaccination is a key preventive strategy, but vaccine uptake and effectiveness can vary [27].
- **Human Metapneumovirus (hMPV):** hMPV causes a range of respiratory illnesses similar to RSV, from mild upper respiratory infections to severe bronchiolitis and pneumonia, especially in infants and young children [28].
- **Adenoviruses:** Adenoviruses can cause diverse clinical manifestations, including pharyngitis, conjunctivitis, and pneumonia. They are known for their ability to cause prolonged infections and can contribute to recurrent episodes [29].
- **Coronaviruses (non-SARS-CoV-2):** Several human coronaviruses circulate annually, causing common colds and, less frequently, more severe respiratory

illnesses. Their contribution to RRI is recognized, though often overshadowed by more prominent viral pathogens [30].

5.2.2. Bacterial Pathogens

While viruses are the primary drivers of RRI, bacterial co-infections or secondary bacterial infections can complicate the clinical course and contribute to the severity and recurrence of episodes. Common bacterial pathogens include *Streptococcus pneumoniae*, *Haemophilus influenzae*, and *Moraxella catarrhalis*, which are frequently implicated in otitis media, sinusitis, and pneumonia [31]. Atypical bacterial pathogens such as *Mycoplasma pneumoniae* and *Chlamydia pneumoniae* are also recognized as causes of recurrent RTIs, particularly in preschool-aged children [32]. The increasing concern about antimicrobial resistance (AMR) highlights the importance of judicious antibiotic use, especially given the predominantly viral etiology of RRI [9].

5.3. Risk Factors for Recurrent Respiratory Infections

The susceptibility of preschool children to RRI is multifactorial, arising from a complex interplay of host, environmental, and socioeconomic factors. Understanding these risk factors is paramount for developing effective preventive strategies.

5.3.1. Host-Related Factors

- **Age and Immunological Immaturity:** As previously noted, younger children, particularly infants and toddlers, are at the highest risk due to their developing immune systems. Their immune responses to novel pathogens are often less robust, and they have limited immunological memory [2]. The waning of maternally acquired antibodies further increases their vulnerability after the first few months of life.
- **Gender:** Several studies suggest a slight male preponderance in the incidence of RRI, although the reasons for this are not fully understood. Hormonal differences, airway anatomy, and immunological variations have been proposed as potential explanations [33].
- **Genetic Susceptibility:** Emerging research indicates that genetic factors can influence an individual's susceptibility to infections. Polymorphisms in genes related to innate immunity (e.g., Toll-like receptors, mannose-binding lectin) have been associated with increased risk or severity of RTIs [34]. For example, a review highlighted that genetic variants may confer a higher or lower risk of developing certain infections, including RTIs [1].

- **Atopy and Allergic Conditions:** Atopic disorders, such as asthma, allergic rhinitis, and atopic dermatitis, are significant predisposing factors for RRIIs [35]. Children with these conditions often have chronically inflamed airways, impaired mucociliary clearance, and altered immune responses, making them more susceptible to infections and experiencing more severe symptoms. A meta-analysis identified asthma as a major risk factor for recurrent respiratory tract infections in children [36].
- **Minor Immune Defects:** While severe primary immunodeficiencies are rare, minor or transient immune defects can contribute to recurrent infections. These include specific antibody deficiencies (e.g., IgA or IgG subclass deficiencies) or functional defects in antibody responses to specific pathogens [37]. These conditions may not present with overt signs of immunodeficiency but can lead to increased susceptibility to common infections.
- **Nutritional Status:** Malnutrition, both undernutrition and obesity, can impair immune function and increase susceptibility to infections. Deficiencies in essential micronutrients, such as Vitamin D, Vitamin A, and zinc, have been linked to increased risk and severity of RTIs [38, 39]. For instance, a study found that recurrent respiratory tract infections in children might be associated with vitamin A deficiency [40]. Breastfeeding, particularly exclusive breastfeeding during the first six months of life, provides crucial immunological protection and is associated with a reduced risk of RTIs [41].
- **Preterm Birth and Underlying Chronic Conditions:** Premature infants often have underdeveloped lungs and immune systems, making them highly vulnerable to severe and recurrent respiratory infections [42]. Other chronic conditions, such as congenital heart disease, cystic fibrosis, or neurological disorders, can also predispose children to RRIIs [43].

5.3.2. Environmental Factors

- **Exposure to Passive Smoking:** Secondhand smoke exposure is one of the most consistently identified and modifiable risk factors for RRIIs in children [13]. Parental smoking, particularly indoors, significantly increases the frequency and severity of respiratory illnesses, including otitis media, bronchitis, and pneumonia, by damaging the respiratory epithelium and impairing immune defenses [14].
- **Indoor Air Quality:** Poor indoor air quality, resulting from inadequate ventilation, presence of indoor allergens (e.g., dust mites, pet dander), mold, and pollutants from cooking or heating, contributes to respiratory irritation and increased infection risk [15]. Crowded living conditions can exacerbate this by increasing pathogen transmission.

- **Daycare Attendance:** Children attending daycare or other group childcare settings experience a higher incidence of RTIs, especially during their first year of attendance [18]. This is due to increased exposure to a wider variety of pathogens and the close contact facilitating transmission among children. While beneficial for social development, it is a recognized risk factor for infection.
- **Environmental Pollution:** Outdoor air pollution, including particulate matter and gaseous pollutants, can negatively impact respiratory health and increase susceptibility to infections [4]. In regions like Riyadh, dust storms can also contribute to respiratory symptoms and potentially increase vulnerability to infections [12].

5.3.3. Socioeconomic and Household Factors

- **Socioeconomic Status (SES):** Lower SES is generally associated with a higher incidence of RRIs. This can be attributed to various factors including crowded living conditions, poorer nutrition, limited access to healthcare services, and reduced health literacy [17]. Parental education level, often a proxy for SES, has been linked to health-seeking behaviors and adherence to preventive measures [16].
- **Family Size and Siblings:** Larger family sizes and the presence of older siblings, especially those attending school or daycare, are associated with an increased risk of RRIs in younger children. Older siblings can introduce pathogens into the household, leading to higher exposure rates for younger children [23].
- **Access to Healthcare:** Timely access to appropriate healthcare services, including preventive care, vaccinations, and prompt medical attention for acute illnesses, can influence the course and recurrence of respiratory infections. Limited access due to financial constraints or geographical barriers can lead to delayed diagnosis and management [17].

5.4. Parental Awareness and Practices

Parental awareness, knowledge, and practices are crucial determinants of child health outcomes, particularly in the context of preventable conditions like RRIs. Misconceptions or lack of knowledge can lead to inappropriate health behaviors, delayed care-seeking, and suboptimal management of illnesses.

- **Knowledge of RRI Causes and Prevention:** Studies indicate varying levels of parental knowledge regarding the causes of RTIs (e.g., distinguishing between viral and bacterial infections) and effective preventive measures. For instance, a study on parental awareness towards antibiotic use for upper respiratory tract infections in children highlighted significant gaps in knowledge regarding antibiotic efficacy

against viral infections [9]. Effective hand hygiene, avoiding sick contacts, and ensuring up-to-date vaccinations are fundamental preventive strategies that require parental understanding and adherence [8].

- **Attitudes Towards Antibiotic Use:** A significant concern in RRI management is the inappropriate use of antibiotics. Parents often expect antibiotic prescriptions for viral infections, driven by misconceptions about their efficacy or a desire for rapid recovery [9]. This parental demand can influence prescribing practices, contributing to the global crisis of antimicrobial resistance. Educational interventions targeting parental attitudes towards antibiotics are crucial to promote judicious use.
- **Health Information Seeking Behavior:** Parents obtain health information from various sources, including healthcare professionals, family, friends, and increasingly, the internet and social media. Understanding the preferred and trusted sources of information for parents in Riyadh is essential for effective health communication campaigns [10].
- **Impact of Awareness on Outcomes:** Research suggests a direct correlation between higher parental awareness and better child health outcomes. Informed parents are more likely to implement preventive measures, recognize warning signs of severe illness, and seek timely and appropriate medical care, thereby potentially reducing the frequency and severity of RRIs [8]. Conversely, a lack of awareness can lead to delayed presentation, complications, and increased healthcare burden.

5.5. Gaps in Current Literature and Justification for the Study

While the global literature provides a robust understanding of RRIs and their risk factors, several critical gaps exist, particularly concerning the specific context of Riyadh, Saudi Arabia:

1. **Localized Comprehensive Data:** Much of the existing research from Saudi Arabia focuses on specific pathogens or clinical aspects of respiratory infections. There is a paucity of comprehensive studies that simultaneously investigate a broad spectrum of environmental, socioeconomic, and child-specific risk factors for recurrent respiratory infections in preschool children within Riyadh.
2. **In-depth Parental Awareness Assessment:** While some studies touch upon parental knowledge regarding specific health issues (e.g., antibiotic use), a detailed assessment of parental awareness, knowledge, and practices concerning the full spectrum of RRI causes, prevention, and management in Riyadh is lacking.

Understanding these nuances is crucial for developing targeted educational interventions.

3. **Interplay of Factors:** Few studies comprehensively explore the complex interplay between parental awareness, various risk factors, and RRI outcomes in a single investigation within the Riyadh context. This study aims to provide a holistic view, identifying how these factors interact to influence the burden of RRIs.
4. **Actionable Recommendations:** By addressing these gaps, this research aims to generate highly localized, actionable evidence that can directly inform public health policies and educational programs in Riyadh. This will move beyond general recommendations to provide specific, culturally sensitive strategies tailored to the needs of the community.

In conclusion, this literature review underscores the critical need for the proposed study. By systematically investigating parental awareness and associated risk factors for recurrent respiratory infections among preschool children in Riyadh, Saudi Arabia, this research will contribute significantly to both the local public health landscape and the broader scientific understanding of pediatric respiratory epidemiology. The findings will provide a robust evidence base for developing effective preventive and management strategies, ultimately improving the health and well-being of young children in the region.

6. Research Methodology

This section provides a detailed exposition of the methodological framework that will guide the proposed study. It encompasses the study design, target population, sampling strategy, data collection instruments and procedures, data management protocols, statistical analysis plan, ethical considerations, and a discussion of potential challenges and limitations.

6.1. Study Design

This study will employ a quantitative, cross-sectional descriptive design. A cross-sectional design is particularly well-suited for this research as it allows for the simultaneous assessment of the prevalence of recurrent respiratory infections (RRIs), the distribution of various associated risk factors, and the levels of parental awareness within the target population at a single point in time. This approach provides a snapshot of the current situation, enabling the identification of associations and correlations between variables without inferring causality. The descriptive nature of the study will facilitate a comprehensive characterization of the study population and the key variables of interest.

6.2. Study Population

The target population for this study will be parents or legal guardians of preschool children (aged 1 month to 5 years) residing in Riyadh, Saudi Arabia. The age range of 1 month to 5 years is chosen because this demographic is particularly vulnerable to RRIs due to their developing immune systems, increased exposure to pathogens in group settings (e.g., daycare), and the typical peak incidence of respiratory infections in early childhood. Parents or legal guardians will be included if they are the primary caregivers for the child, are at least 18 years of age, and are able to provide informed consent and complete the questionnaire in either Arabic or English. Exclusion criteria will include parents of children with known severe chronic respiratory diseases (e.g., cystic fibrosis, severe congenital heart disease with significant pulmonary involvement) or diagnosed primary immunodeficiencies, as these conditions represent distinct clinical entities that could confound the findings related to general RRI risk factors.

6.3. Sampling Strategy

A multi-stage sampling technique will be utilized to ensure a representative sample from the diverse population of Riyadh. This approach aims to enhance the generalizability of the findings within the city:

- 1. Stage 1: Stratification by Geographical Area:** Riyadh will be stratified into major geographical areas or municipalities (e.g., North, South, East, West, Central) based on available demographic data and urban planning divisions. This stratification will help account for potential variations in socioeconomic status, environmental exposures, and access to healthcare services across different parts of the city.
- 2. Stage 2: Random Selection of Primary Healthcare Centers/Kindergartens:** Within each selected geographical stratum, a random sample of primary healthcare centers (PHCs) and/or private/public kindergartens will be selected. PHCs are chosen as they serve a broad cross-section of the population and are often the first point of contact for pediatric health concerns. Kindergartens are included to capture children in group settings, which are known to be relevant for RRI transmission. A proportional allocation method will be used to determine the number of PHCs/kindergartens to be selected from each stratum, ensuring representation based on population density or facility size.
- 3. Stage 3: Systematic Random Sampling of Parents:** At the selected PHCs and kindergartens, systematic random sampling will be employed to recruit eligible parents. For PHCs, parents attending pediatric clinics for routine check-ups or non-emergency visits will be approached. For kindergartens, parents of enrolled children will be invited to participate. A sampling interval will be determined based

on the expected number of eligible parents and the desired sample size from each facility. For example, every nth parent or child on a registration list will be invited.

6.3.1. Sample Size Calculation

The sample size will be calculated using the formula for estimating a single population proportion, given the cross-sectional design and the primary outcome of RRI prevalence. Based on existing literature, the estimated prevalence of RRIs in preschool children is approximately 25% [1, 2]. To ensure sufficient statistical power, the following parameters will be used:

- **Anticipated Prevalence (P):** 0.25 (25%)
- **Confidence Level:** 95% (Z-score = 1.96)
- **Margin of Error (d):** 0.05 (5%)

The formula for sample size (n) is: $n = (Z^2 * P * (1-P)) / d^2$

Substituting the values: $n = (1.96^2 * 0.25 * (1-0.25)) / 0.05^2$

$n = (3.8416 * 0.25 * 0.75) / 0.0025$

$n = (0.7203) / 0.0025$

$n \approx 288.12$

Considering a potential non-response rate or incomplete questionnaires (e.g., 15-20%), the calculated sample size will be inflated to ensure adequate data collection. Therefore, a target sample size of approximately 350-400 parents will be aimed for to account for potential attrition and ensure robust statistical analysis.

6.4. Data Collection Instruments and Procedures

Data will be collected primarily through a structured, self-administered questionnaire. The questionnaire will be meticulously designed to capture all variables relevant to the research objectives and hypotheses. It will be available in both Arabic and English to ensure accessibility and cultural appropriateness for the diverse population of Riyadh. The development process will involve several steps:

1. **Content Development:** Questions will be formulated based on a thorough review of existing validated questionnaires on RRI risk factors and parental awareness, adapted to the specific context of Riyadh. Expert opinion from pediatricians, public health specialists, and epidemiologists in Saudi Arabia will be sought to ensure content validity and relevance.

2. **Structure of the Questionnaire:** The questionnaire will be organized into distinct sections to enhance clarity and ease of completion:

- **Section 1: Demographic Information:** Child's age, gender, birth order; parental age, education level, occupation, household income; family size, number of children under 5 in the household.
- **Section 2: Child's Health History:** Frequency, duration, and severity of RRIs in the past 12 months; history of hospitalization for RTIs; presence of chronic conditions (e.g., asthma, allergies); vaccination status.
- **Section 3: Potential Risk Factors:** Exposure to passive smoking (indoor/outdoor); home ventilation; presence of mold/dampness; daycare attendance; feeding practices (breastfeeding history); vitamin/mineral supplementation.
- **Section 4: Parental Awareness:** Knowledge questions on RRI causes (viral vs. bacterial), prevention methods (hand hygiene, avoiding sick contacts, vaccination), and appropriate management. Attitudes towards antibiotic use will be assessed using a 5-point Likert scale (Strongly Disagree to Strongly Agree).

3. **Pre-testing and Pilot Study:** Before full-scale data collection, the questionnaire will undergo pre-testing with a small sample of 20-30 parents from the target population. This pilot study will assess the clarity of questions, ease of understanding, cultural appropriateness, and time required for completion. Feedback from the pilot will be used to refine and finalize the questionnaire, ensuring its reliability and validity.

4. **Administration:** The questionnaire will be primarily administered through secure online platforms (e.g., Google Forms, SurveyMonkey, Qualtrics). This method offers several advantages, including wider reach, cost-effectiveness, and automated data entry, reducing transcription errors. Links to the online questionnaire will be distributed via various channels:

- **Social Media Platforms:** WhatsApp groups, Facebook community pages, and other popular social media channels frequented by parents in Riyadh will be utilized. This will involve collaborating with community leaders or administrators of relevant groups.
- **Primary Healthcare Centers/Kindergartens:** With appropriate permissions, QR codes or links to the online questionnaire will be provided to parents at the selected facilities. Brief explanations about the study will be offered by trained research assistants.

Informed consent will be obtained electronically at the beginning of the online questionnaire. Participants will be clearly informed about the study's purpose, their right to withdraw at any time, and the confidentiality and anonymity of their responses. Participation will be entirely voluntary.

6.5. Data Management

Upon collection, all data will be securely managed to ensure confidentiality, integrity, and accuracy. For online questionnaires, data will be directly captured in the chosen platform, which typically offers secure storage and export functionalities. For any paper-based questionnaires (if used), data will be manually entered into a secure database by trained personnel. A double-entry system will be implemented for a subset of the data to minimize data entry errors. All electronic data will be stored on password-protected computers with restricted access, and backed up regularly. Anonymity will be maintained by assigning unique identifiers to each participant, ensuring that no personally identifiable information is linked to the responses. Data will be retained for a specified period (e.g., 5 years) after the completion of the study, as per ethical guidelines, and then securely disposed of.

6.6. Statistical Analysis Plan

All collected data will be analyzed using appropriate statistical software, such as IBM SPSS Statistics (Statistical Package for the Social Sciences) or R statistical software. The analysis will proceed in several stages:

1. **Data Cleaning and Preparation:** This will involve checking for missing values, outliers, and inconsistencies. Missing data will be handled using appropriate methods (e.g., listwise deletion, imputation) depending on the extent and pattern of missingness. Variables will be coded and transformed as necessary for analysis.
2. **Descriptive Statistics:** Descriptive statistics will be used to summarize the demographic characteristics of the study population, the prevalence of RRI, the distribution of various risk factors, and the levels of parental awareness. This will include frequencies and percentages for categorical variables, and means, medians, standard deviations, and interquartile ranges for continuous variables.
3. **Bivariate Analysis:** To explore initial associations between variables, bivariate analyses will be conducted:
 - **Chi-square tests (χ^2):** Will be used to examine associations between categorical variables, such as the relationship between exposure to passive smoking (Yes/No) and the incidence of RRI (e.g., 0-2 episodes vs. >2 episodes).

- **Independent samples t-tests or Analysis of Variance (ANOVA):** Will be used to compare means of continuous variables across different groups (e.g., comparing mean RRI frequency between children attending daycare vs. those not attending).
- **Pearson correlation coefficients:** Will be calculated to assess the strength and direction of linear relationships between continuous variables (e.g., parental education level and parental awareness score).

4. **Multivariate Analysis (Logistic Regression):** To identify independent predictors of recurrent respiratory infections and to control for potential confounding variables, multivariate logistic regression models will be constructed. The dependent variable will be the presence or absence of recurrent respiratory infections (defined based on a threshold, e.g., >3 episodes in 12 months). Independent variables will include significant risk factors identified in the bivariate analysis, as well as demographic variables. Odds Ratios (OR) with 95% Confidence Intervals (CI) will be calculated to quantify the strength of association between the predictors and the outcome. Model fit and assumptions will be assessed.

5. **Statistical Significance:** A p-value of less than 0.05 ($p < 0.05$) will be considered statistically significant for all analyses.

6.7. Ethical Considerations

This study will adhere to the highest ethical standards throughout all phases of the research. Ethical approval will be sought and obtained from the Institutional Review Board (IRB) or Research Ethics Committee of a recognized academic or health institution in Saudi Arabia (e.g., King Saud University, Ministry of Health). Key ethical considerations include:

1. **Informed Consent:** Prior to participation, all parents or legal guardians will be provided with a clear and comprehensive informed consent form. This form will detail the study's purpose, procedures, potential risks and benefits, confidentiality measures, and their right to withdraw at any time without penalty. For online questionnaires, electronic consent will be obtained by requiring participants to check a box indicating their understanding and agreement before proceeding.
2. **Confidentiality and Anonymity:** All collected data will be treated with strict confidentiality. Participants will remain anonymous, as no personally identifiable information (e.g., names, addresses, phone numbers) will be collected. Unique identifiers will be used for data entry and analysis. Data will be stored securely on password-protected systems, accessible only to the research team.

3. **Voluntary Participation:** Participation in the study will be entirely voluntary. Participants will be informed that they have the right to refuse to answer any question or withdraw from the study at any point without any consequences.
4. **Minimizing Harm:** The study poses minimal risk to participants. The questionnaire is designed to be non-invasive and will not involve any medical procedures. Potential discomfort might arise from sensitive questions (e.g., income, smoking habits), but participants will be reassured about anonymity and their right to skip questions.
5. **Beneficence:** The potential benefits of the research, including contributing to a better understanding of RRIs in Riyadh and informing public health interventions, outweigh any minimal risks. The findings are expected to ultimately benefit the health and well-being of preschool children in the region.
6. **Data Security and Storage:** All electronic data will be encrypted and stored on secure servers. Physical copies of consent forms (if any) will be stored in locked cabinets. Data will be retained for a period consistent with institutional and national guidelines (e.g., 5 years) and then securely destroyed.
7. **Cultural Sensitivity:** The questionnaire and all communication materials will be developed with cultural sensitivity, ensuring that language, concepts, and questions are appropriate and respectful of local customs and beliefs in Riyadh.

6.8. Potential Challenges and Limitations

Despite careful planning, the study may encounter several challenges and inherent limitations:

1. **Response Rate and Representativeness:** Achieving a high response rate for online questionnaires can be challenging. While multi-stage sampling aims for representativeness, self-selection bias might occur, where parents with a particular interest in the topic are more likely to participate. Strategies to mitigate this include clear communication, incentives (if ethically permissible and approved by IRB), and broad distribution channels.
2. **Recall Bias:** As the study relies on parental self-reporting for historical data (e.g., frequency of past infections), recall bias is a potential limitation. Parents may not accurately remember the exact number or duration of RRI episodes. This will be addressed by focusing on a recent timeframe (past 12 months) and providing clear definitions of respiratory infections.

3. **Social Desirability Bias:** Participants may provide answers that they perceive as socially acceptable or desirable, particularly concerning sensitive topics like smoking habits or adherence to health recommendations. Anonymity and clear assurances of confidentiality will be emphasized to minimize this bias.
4. **Causality vs. Association:** The cross-sectional design, by its nature, can only establish associations or correlations between variables, not cause-and-effect relationships. Longitudinal studies would be required to determine causality. However, this study will provide valuable baseline data for future longitudinal investigations.
5. **Definition of RRI:** The lack of a single, universally agreed-upon definition for RRIs can make comparisons with other studies challenging. This study will clearly state its operational definition of RRIs to ensure transparency.
6. **Generalizability:** While efforts will be made to ensure representativeness within Riyadh, the findings may not be directly generalizable to other cities in Saudi Arabia or other countries due to variations in climate, healthcare systems, cultural practices, and socioeconomic conditions.
7. **Language Barriers:** Although the questionnaire will be available in both Arabic and English, parents who speak neither language may be excluded, potentially limiting the representativeness of the sample, particularly among certain expatriate communities.

Despite these challenges, the proposed methodology is robust and designed to provide valuable insights into parental awareness and risk factors for RRIs in Riyadh, contributing significantly to public health efforts in the region.

7. Research Limits:

This study is subject to several limitations that should be considered when interpreting its findings:

1. **Geographical Scope:** The study will be conducted exclusively in Riyadh, Saudi Arabia. Therefore, the findings may not be generalizable to other regions within Saudi Arabia or to other countries with different demographic, environmental, socioeconomic, or healthcare contexts.
2. **Age Group:** The study population is limited to preschool children aged 1 month to 5 years. While this age group is highly susceptible to RRIs, the findings may not be applicable to older children or adults.

3. **Self-Reported Data:** The reliance on parental self-reporting for information regarding the child's health history, incidence of RRIs, and exposure to risk factors may introduce recall bias. Parents might not accurately remember the frequency or duration of past infections, or they might underreport certain sensitive information (e.g., smoking habits).
4. **Cross-Sectional Design:** The cross-sectional nature of the study allows for the identification of associations but cannot establish causality. It will not be possible to determine whether identified risk factors directly cause RRIs or if there are other underlying factors influencing both.
5. **Questionnaire-Based Data Collection:** While questionnaires are efficient for collecting data from a large sample, they may not capture the nuances of parental awareness or the complexity of risk factors. The depth of information might be limited compared to qualitative methods.
6. **Social Desirability Bias:** Parents may provide answers that they perceive as socially desirable rather than entirely accurate, particularly concerning practices related to child health and hygiene.
7. **Exclusion Criteria:** The exclusion of children with certain congenital or chronic conditions aims to create a more homogenous study population but also limits the generalizability of findings to children with such underlying health issues.

Despite these limitations, the study aims to provide valuable insights into the specific context of Riyadh, contributing to a better understanding of RRIs and informing targeted public health interventions.

8. The General Perception of the Research Structure:

The research will follow a standard scientific inquiry structure, progressing from a clear problem statement to a detailed methodology and expected outcomes. The overall structure will be as follows:

1. **Introduction:** Providing background on recurrent respiratory infections globally and in Saudi Arabia, establishing the significance of the problem.
2. **Research Problem:** Clearly articulating the specific gap in knowledge that this study aims to address.
3. **Importance and Objectives:** Outlining the rationale for the study and the specific aims it seeks to achieve.
4. **Research Hypotheses:** Presenting testable statements that guide the investigation.
5. **Literature Review:** A comprehensive synthesis of existing research, identifying key findings, common risk factors, and gaps in the literature, particularly concerning Riyadh.

6. **Research Methodology:** Detailing the study design, population, sampling strategy, data collection instruments (questionnaire), and statistical analysis plan.
7. **Research Limits:** Acknowledging the constraints and potential biases of the study.
8. **Ethical Considerations:** Ensuring the protection of participants' rights, privacy, and well-being.
9. **Expected Outcomes and Dissemination:** Discussing the anticipated results and how they will be shared with relevant stakeholders.
10. **Timeline and Budget (Preliminary):** A proposed schedule for the research activities and an estimated budget for resources.
11. **References:** A comprehensive list of all cited sources.
12. **Appendices:** Including the full questionnaire and any other supplementary materials.

This structure ensures a logical flow of information, transparency in research design, and a comprehensive approach to investigating the research question. The preliminary sections drafted so far (Research Title, Introduction, Research Problem, Importance and Objectives, Research Hypotheses, Literature Review, and Research Methodology) form the core of this proposal, with the remaining sections to be fully developed as the research progresses.

9. Initial Reference List (Updated):

1. Viral etiology of respiratory infections in children in southwestern Saudi Arabia using multiplex reverse-transcriptase polymerase chain reaction. (PMC, URL: <https://pmc.ncbi.nlm.nih.gov/articles/PMC4362149/>)
2. Transforming respiratory tract infection diagnosis in the kingdom of Saudi Arabia through point-of-care testing: A white paper for policy makers. (ScienceDirect, URL: <https://www.sciencedirect.com/science/article/pii/S0732889324003559>)
3. Burden of bronchiolitis post-COVID-19 pandemic in children less than 2 years old in 2021–2024: experience from a tertiary center in Saudi Arabia. (BMC Pediatrics, URL: <https://bmcpediatr.biomedcentral.com/articles/10.1186/s12887-025-05801-7>)
4. Risk factors for recurrent respiratory tract infection in preschool-aged children. (PubMed, URL: <https://pubmed.ncbi.nlm.nih.gov/33173178/>)
5. Risk Factors for Recurrent Respiratory Infections in Preschool Children in China. (PMC, URL: <https://pmc.ncbi.nlm.nih.gov/articles/PMC4359599/>)
6. Recurrent respiratory infections in children: New perspectives. (ScienceDirect, URL: <https://www.sciencedirect.com/science/article/pii/S2667009723000714>)
7. Why do some Children Get Sick with Recurrent Respiratory Infections? (PubMed, URL: <https://pubmed.ncbi.nlm.nih.gov/37702165/>)

8. Recurrent upper respiratory tract infections in early childhood: a newly defined clinical condition. (PMC, URL: <https://pmc.ncbi.nlm.nih.gov/articles/PMC10873936/>)
9. Parental Awareness Towards Antibiotic Use for Upper Respiratory Tract Infections in Children. (PMC, URL: <https://pmc.ncbi.nlm.nih.gov/articles/PMC11936846/>)
10. Parental knowledge about respiratory syncytial virus and attitudes toward infant immunization with monoclonal antibodies in France. (ScienceDirect, URL: <https://www.sciencedirect.com/science/article/pii/S0929693X24001374>)

Questionnaire: Parental Awareness and Associated Risk Factors for Recurrent Respiratory Infections Among Preschool Children in Riyadh, Saudi Arabia

Instructions for Parents:

Thank you for participating in this important research study. Your responses will help us understand more about recurrent respiratory infections in preschool children in Riyadh and develop better ways to support families. Please answer the following questions as accurately as possible. Your participation is voluntary, and all your answers will be kept confidential.

Section 1: Demographic Information

1. **Child's Age (in months):** _____
2. **Child's Gender:**
 - ☐ Male
 - ☐ Female
3. **Child's Birth Order (e.g., 1st child, 2nd child, etc.):** _____
4. **Your Age (Parent/Guardian):** _____
5. **Your Highest Level of Education:**
 - ☐ No formal education
 - ☐ Primary school
 - ☐ Middle school
 - ☐ High school
 - ☐ Diploma

- ☐ Bachelor's degree
- ☐ Master's degree or higher

6. Your Occupation: _____

7. Household Monthly Income (in Saudi Riyals):

- ☐ Less than 5,000
- ☐ 5,000 - 9,999
- ☐ 10,000 - 14,999
- ☐ 15,000 - 19,999
- ☐ 20,000 or more

8. Number of people living in your household: _____

9. Number of children under 5 years old in your household: _____

Section 2: Child's Health History

1. In the past 12 months, how many times has your child had a respiratory infection (e.g., cold, cough, sore throat, ear infection, bronchitis, pneumonia)?

- ☐ 0-2 times
- ☐ 3-5 times
- ☐ 6-8 times
- ☐ More than 8 times

2. On average, how long does each respiratory infection last?

- ☐ Less than 4 days
- ☐ 4-7 days
- ☐ 8-14 days
- ☐ More than 14 days

3. Has your child ever been hospitalized for a respiratory infection?

- ☐ Yes
- ☐ No

4. Does your child have any of the following chronic conditions? (Select all that apply)

- ☐ Asthma
- ☐ Allergies (e.g., allergic rhinitis, eczema)
- ☐ Other (please specify): _____

5. Is your child up-to-date with all recommended vaccinations?

- ☐ Yes
 - ☐ No
 - ☐ I'm not sure
-

Section 3: Potential Risk Factors

1. **Does anyone in your household smoke tobacco products (e.g., cigarettes, shisha)?**
 - ☐ Yes, inside the house
 - ☐ Yes, but only outside the house
 - ☐ No
 2. **How would you describe the ventilation in your home?**
 - ☐ Good (windows are opened regularly)
 - ☐ Fair (windows are opened sometimes)
 - ☐ Poor (windows are rarely opened)
 3. **Have you noticed any mold or dampness in your home?**
 - ☐ Yes
 - ☐ No
 4. **Does your child attend daycare or a nursery?**
 - ☐ Yes, full-time
 - ☐ Yes, part-time
 - ☐ No
 5. **How was your child fed during the first 6 months of life?**
 - ☐ Exclusively breastfed
 - ☐ Mostly breastfed with some formula
 - ☐ Mostly formula with some breastmilk
 - ☐ Exclusively formula-fed
 6. **Does your child take any vitamin or mineral supplements (e.g., Vitamin D, Vitamin C)?**
 - ☐ Yes, regularly
 - ☐ Yes, sometimes
 - ☐ No
-

Section 4: Parental Awareness

Please indicate your level of agreement with the following statements:

Statement	Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree
21. Most respiratory infections in children are caused by viruses.	☐	☐	☐	☐	☐
	☐	☐	☐	☐	☐

Statement	Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree
22. Antibiotics are effective against viral infections.					
23. It is important to finish the full course of antibiotics as prescribed by the doctor.	☐	☐	☐	☐	☐
24. I know the warning signs that indicate a respiratory infection is becoming serious.	☐	☐	☐	☐	☐
25. Frequent handwashing is an effective way to prevent the spread of respiratory infections.	☐	☐	☐	☐	☐
26. Keeping my child away from sick people can help prevent respiratory infections.	☐	☐	☐	☐	☐
27. I feel confident in managing my child's respiratory infection symptoms at home.	☐	☐	☐	☐	☐
28. I would give my child antibiotics from a previous prescription without consulting a doctor.	☐	☐	☐	☐	☐

Thank you for your time and valuable contribution to this research!